OUTLINE SHEET 4-12-1
Packing and Gasket

A. Introduction

Most of the maintenance accomplished by shipboard engineers involve replacement of packing and gaskets. This lesson covers the types of packing and gaskets used in the machinery spaces.

B. Enabling Objectives

4.33 **DESCRIBE** the material used in packing a moving joint.

4.34 **DESCRIBE** the material used in packing a fixed joint.

4.35 **SELECT** the packing and gasket material using the packing and gasket chart.

4.36 **DESCRIBE** the safety precautions used in the vicinity of fluids under pressure.

C. Topic Outline

1. Introduction
2. Overview
3. Types of Joints
4. Types of Packing
5. Types of Gaskets
6. Packing and Gasket Chart
7. Safety Precautions
8. Summary and Review
9. Assignment

ASSIGNMENT SHEET 4-12-2
Packing and Gasket

A. Introduction

This material is to be completed prior to the material being covered in class.

B. Enabling Objectives

Refer to enabling objectives in Outline Sheet 4-12-1.

C. Study Assignment

1. Fireman NAVEDTRA 12001
2. Machinist's Mate 3 & 2 NAVEDTRA 12144

D. Study Questions

1. List three examples of moving joints?
2. What are the two methods of cutting gaskets?
3. What is indicated by the 4-digit number identifying the type of packing or gasket?

INFORMATION SHEET 4-12-3
Packing and Gasket

A. Introduction

This information describes the organization of Engineering Department.

B. Reference

Fireman NAVEDTRA 12001
Machinist's Mate 3 & 2 NAVEDTRA 12144

C. Information

I. Packing and Gasket material is used to seal joints.
   A. Gasket materials are used to seal fixed joints in steam, water, fuel, air, lube oil, and other piping systems
   B. Packing materials are used to seal joints that slide or rotate (moving joints).

II. Sealing a moving joint is difficult because the seal must be tight enough to prevent leakage, yet loose enough to allow movement.
   A. Packing uses bulk material (packing) that is reshaped by compression.
   B. Packing can come in a variety of forms and materials such as:
      1. braided flax
      2. High-pressure rod graphite-lubricated asbestos
      3. asbestos cloth and resilient rubber
      4. rings made out of:
         a) braided copper
         b) pressed cotton fabric
         c) wire inserted asbestos
         d) molded rings
      5. A corrugated ribbon packing has been developed for use on valves.
         a) Corrugated ribbon packing is suitable for use in systems of high temperatures.
   C. Packing is inserted into stuffing boxes.
      1. Stuffing boxes are annular chambers located around the rotating shaft.
      2. The packing material is held in place by gland nuts or other devices.
      3. It is cut to length, rolled on the valve stem, and pushed into the stuffing box to form a solid, endless packing ring when compressed.

D. If the stem and packing of a valve are in good condition, you can normally stop packing gland leaks by tightening up on the packing gland or nut. Over-tightening may cause the valve to score or bend the stem, or even seize.

E. Basic procedures for repacking valves.

1. Remove packing gland or nut
2. Remove old packing using a packing puller. This must be done carefully to avoid scoring of the stem.
3. Inspect and clean the valve stem and gland.
4. Add new packing.
   a) Cut the packing so the ends fit flush and stagger the splits from each other to prevent leakage.
   b) Some valves are provided with precut packing available through the supply system, which must be soaked in pure (distilled) water before installation.
   c) The same number of rings should be inserted into the valve as was originally removed.
5. Reinstall the packing gland or nut.
6. Do not over tighten, operate the valve to ensure correct tightness. Final inspection and tightening should be done under system pressure.

III. Fixed joints such as flanges and pump casings require gasket material in different form.

A. Full-faced gaskets can be cut from sheets of material such as compressed asbestos, cork, felt etc.

1. To cut a full-faced gasket lay the sheet on the flange. Scribe in the bolt holes and flange circle lines with light blows of a ball peen hammer. Using a gasket punch, 1/16 larger in diameter than the bolts, cut the bolt holes into the gasket material.
2. Use a piece of hardwood as the supporting and backing surface for the material while punching it to prevent damage to the lips of the punch. After the holes have been punched, use shears or a sharp knife to cut the center and outside circles to form the ring.

B. Serrated-face metal gaskets are made of steel, monel or soft iron.

1. They have raised serration’s to make a better seal at the piping flange joints
2. Pressure tends to force the serrated faces tighter against the adjoining flange.

C. Spiral wound metallic asbestos gaskets are made of two parts.

1. The first is interlocked piles of performed corrugated metal and asbestos strips, spiral wound, called a filler. The filler is replaceable.

2. The second is a solid metal outer or centering ring, called a retaining ring.
   a) The retaining ring is reusable.
   b) The retaining ring acts as reinforcement to prevent blowouts.
3. The gaskets can be compressed to the thickness of the centering ring.

IV. The Navy has simplified the selection of packing and gasket materials commonly used. The Naval Sea Systems Command has prepared a packing and gasket chart.
   A. This chart shows the symbol numbers and the recommended applications of all types and kinds of packing and gasket materials.
   B. A four-digit symbol number identifies each type of packing and gasket.
   C. The first digit indicates the class of service with respect to fixed and moving joints.
      1. If the first digit is 1, it indicates a moving joint.
      2. If the first digit is 2, it indicates a fixed joint.
   D. The second digit indicates the material of which the packing or gasket is primarily composed. This may be asbestos, vegetable fiber, rubber, metal, and so on.
   E. The third and fourth number indicate the different styles or forms of the packing or gaskets made from the material.
   F. Suppose you are required to repack and install a valve in a 300-psi saturated steam line. By referring to the packing and gasket chart, you will find several materials that are suitable for repacking the valve:
      1. symbol 1103 asbestos rod, braided, plain.
      2. symbol 1104 asbestos rod, braided, wire insertion.
      3. symbol 1430 Metallic, flexible
   G. Notice that the first digit is 1 in each case, to indicate that the packing is suitable for a moving joint.
   H. To install the valve, you will need suitable gaskets. In this case the first digit will be 2. By referring to the packing and gasket chart, you will find that you can use any of the following gasket materials:
      1. Symbol 2150 asbestos, sheet, compressed
      2. Symbol 2151 asbestos, metallic, cloth sheet
      3. Symbol 2410 gasket, metallic asbestos spiral wound.

V. When renewing packing and gaskets, there are several safety precaution to be followed.
   A. Asbestos materials are health hazardous and require special storage, handling and disposal according to chapter 635 of Naval Ship's Technical Manual and OPNAVINST 5100.19, NAVOSH Program Manual for Forces Afloat.

B. When breaking open flanges:
   1. Ensure there is no pressure in the line
   2. Ensure all valves used to isolate are firmly secured, wired closed and tagged.
   3. Completely drain the line.
   4. Have two flange-securing bolts and nuts 180 degrees opposite remain in place until the others are removed. These bolts are then slackened to allow breaking of the joint. They are removed after the line is clear.
   5. Take appropriate safety precaution when opening flammable liquid lines
   6. Ensure proper ventilation before joints are broken in closed compartments.
   7. Thoroughly clean all sealing surfaces
   8. Ensure the gasket seats cleanly with the flange.
   9. Replace all damaged bolts, studs, and nuts.

C. Most packing precautions can be avoided by first checking the manufacturer's specifications and the packing and gasket chart.
   1. Do not use metallic or semi-metallic packing on bronze or brass shafts, scoring may result.
   2. Do not use packing with rubber on high speed shafts, it may over heat.
   3. Always ensure the packing used is the one called for by the manufacture